Presentation Title

A Multichannel Averaging Phasemeter for Picometer Precision Laser Metrology

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Biography:

Peter G. Halverson

Ph.D. in Physics, 1989, University of Arizona. research topics included detection techniques for ultra high energy cosmic rays, and searches for lepton flavor violating reactions in muonium atoms.

Went on to work for the University of California at Irvine, on neutrino detectors, such as the Super-Kamiokande project in Japan, searching for(and discovering) neutrino oscillations (again lepton flavor violating).

In 1997, went to work for JPL, on the Space Interferometry Mission, a part of NASA's Origins program. One of the program's stated goal is to use interferometry to discover planets sufficiently earth-like to support life.

Abstract:

NASA's Jet Propulsion Laboratory has developed a precision phasemeter for the Space Interferometry Mission (SIM). The current version of the phasemeter is well-suited for picometer accuracy distance measurements at speeds up to 50 cm/sec when coupled to SIM's 1.3 micron wavelength heterodyne laser metrology gauges.

Since the phasemeter is implemented with industry standard FPGA chips, other accuracy/speed trade-off points can be programmed for applications such as metrology for earth-based long-baseline astronomical interferometry (planet finding), and industrial applications such as translation stage and machine tool positioning.

The phasemeter is a standard VME module, supports 6 metrology gauges, a 128 MHz clock, has programmable hardware averaging, and a maximum distance of 2**32 fringes (2000 meters at 1.3 microns).

This poster presentation will expand on the phasemeter's performance and its applicability to research and industry.

Keywords:

Laser interferometry, laser metrology, heterodyne fringe counting, VME data acquisition, FPGA circuits